Greenwich mean times. The quantities within square brackets are logarithms of seconds of time.

THE CORDOBA OBSERVATION OF COMET 1881 II., ON JUNE 11.—In NATURE, vol. xxv. p. 519, we gave an account of Dr. Gould's observations of the great comet of last year, on the evening of June 11, when he compared it with an object which he could not identify as a fixed star, and it was mentioned that Mr. Tebbutt had suggested that the objects really observed were not the comet and a star, but the two stars λ Eridani and Bradley 718, which have almost precisely the differences of right ascension and declination that were recorded on the night in question. This explanation we considered a probable one, and the same view was taken by the editor of the *Astronomische Nachrichten*, which has occasioned a further communication on the subject from Dr. Gould, who rejects Mr. Tebbutt's suggested solution of the difficulty.

Dr. Gould says the appearance of the comet on June 11 precluded the slightest doubt as to its identity. "The tail itself could not be seen with the telescope, it is true, but the large, diffuse, and very elongated head, much brighter and more definite on the advancing side, was sufficient to enable the veriest tyro to recognise it as a comet." He was placed necessarily on the top of a high observing chair, which he did not leave during the observations, the records being made by his assistant. He had made several sweeps to find a suitable comparison-star, and was about to commence a new one, when he saw the object referred to above, "at the upper part of the field on the left, while the comet was on the right, below." The four published comparisons were then made, and whilst he was in the act of pointing the micrometer-thread upon the comet for a fifth, it disappeared below the horizon. He adds, that no jar of the instrument had taken place; "the field of the telescope was fully under control from the beginning, the declination-clamp remaining tight throughout," and he insists that no one who saw the comet could have entertained the idea that any amount of blurring could have given such an aspect to a fixed star, though it were far brighter than λ Eridani. And he doubts whether a star of the sixth magnitude would have been visible under the circumstances. He made experiments on subsequent evenings, by looking at known stars of different magnitudes when close to the horizon and through different degrees of haze, but in no case did he find one offer the appearance noted on June 11. Hence, he proceeds: "I can only suppose another comet to have been in the field. That it was not a companion-comet is manifest, not only from the relative motion, and from an examination made the next day, but still more from the abundant scrutiny in the northern hemisphere, which could not have failed to detect any companion. That it was not a fixed star, was evident from the beginning."

Thus the matter is left by Dr. Gould, who, it must be admitted, is by far the most competent judge of the probable explanation of the difficulty.

MASKELYNE'S SOLAR PARALLAX.—By communications from Mr. J. Morris, Hatfield Hall, Durham, and Mr. B. J. Hopkins, Marlborough Road, Dalston, we learn that the value of the solar parallax given by Maskelyne, to which allusion was made in this column last week, appears in the third edition of Vince's "Elements of Astronomy," Cambridge, 1810: it was therefore published during his life-time.

THE ROYAL SOCIETY OF CANADA

THIS Society, which has been founded under the auspices of the Marquis of Lorne, and is intended to be to Canada what the Royal Society and the Institute are to England and France respectively, held its first meeting on May 25, 26, and 27. Inaugural addresses were delivered on the 25th by the Marquis, Principal Dawson, and the Hon. P. J. O. Chauveau. For the purpose of reading and discussing papers, the Society is divided into four sections:—(1) French literature, history, and allied subjects; (2) English literature, history, and allied subjects; (3) mathematical, physical, and chemical sciences; (4) geological and biological sciences. The following papers were read in Section 3:—Note on zinc sulphide, by T. McFarlane. On the "transition" resistance to the electric current at the bounding surface between amalgamated zinc and solutions of zinc sulphate, by Prof. J. G. MacGregor, D.Sc. The "transition" resistance in this case was shown to be at any rate not greater than a small fraction of an ohm, the current being weak and the electrodes large. The method of measurement employed was a modification of that formerly used by Beetz.—On the measurement of the resistance of electrolytes by means of Wheatstone's bridge, by the same. In this paper, a new mode of using the bridge was described. Alternate currents were sent through the bridge, and brought into the same direction by a commutator in the galvanometer branch, in which one of Thomson's galvanoscopes was inserted. Two of the arms contained equal metallic resistances; the other two contained, besides metallic resistances, electrolytic cells the same in all respects, except as to length. Thus the errors due to polarisation and possible "transition" resistance were eliminated.—On molecular contraction in natural sulphides, by Prof. E. J. Chapman.—On the law of facility of error in the sum of n independent quantities, each accurate to the nearest unit, by Chas. Carpmael, M.A. The chance of the error in the sum lying between y_1 and y_2, where $y_2 - y_1$ is small, was shown to be

$$\frac{1}{\lfloor n-1} \left\{ \left(\frac{n}{2}+y_1\right)^{n-1} - n\left(\frac{n}{2}+y_1-1\right)^{n-1} + \frac{n \cdot \overline{n-1}}{1 \cdot 2}\left(\frac{n}{2}+y_1-2\right)^{n-1} - \&c. \right\} (y_2-y_1),$$

the series to be continued as long as the part raised to power $n-1$ is positive. This series is approximately equal to

$$\sqrt{\frac{6}{\pi n}} \cdot e^{-\frac{6y^2}{n}} (y_2-y_1).$$

—A symmetrical investigation of the curvature of surfaces; including a discussion of the plane sections of quadrics, the axes of conic sections and of quadrics, by Prof. A. Johnson, LL.D. In this paper it was shown that the leading theorems concerning principal radii of curvature, directions of principal sections, umbilics, lines of curvature, &c., can be obtained directly by a purely analytical investigation, elementary and symmetrical in its character, of the plane sections of a quadric.—Note on the deduction of the equation of continuity, by Prof. Loudon.—Note on the motion of a chain on a fixed curve, by Prof. Cherriman.—Note on the application of a remarkable determinant, by the same.—Note on a question of probabilities, by the same.—On the general regulation of civil time, by Sandford Fleming, C.E.—On the utility of geometry as applied to the arts and sciences, by Chas. Baillarge.

The following papers were read in Section 4:—The distribution of some saline and other plants in the West, by Prof. Maconn. This was an oral exposition, aided by a large map of certain peculiarities in the distribution of maritime Eastern and Western plants in the interior of the continent, and of some peculiar extensions of Southern plants to localities far north of their usual range.—Note on a general section from the Laurentian axis to the Rocky Mountains, north of the 49th parallel, by Dr. G. M. Dawson. This paper gave a summary of the latest facts respecting the succession and distribution of Cretaceous and early Tertiary beds in the North-West Territories, and of the facts obtained respecting their subdivision into groups, and the useful deposits of coal and lignite contained in them.—On the cretaceous and tertiary floras of British Columbia and the North-west territory, by Dr. J. W. Dawson, F.R.S., &c. The researches of the Geological Survey have resulted in the collection of series of fossil plants from a number of localities in the cretaceous of the Pacific coast, and of the eastern base of the Rocky Mountains, in the laramie or lignitic group of the plains, and in the Tertiary Lake Basins of British Columbia. From these it appears that while up to the Middle Cretaceous a flora of strictly Mesozoic character, consisting of pines, cycads, and ferns prevails, the Middle and Upper Cretaceous show the introduction of a larger number of broad-leaved evergreens of modern types. Though there seems to be a continuous prevalence of warm and temperate conditions, from the Upper Cretaceous, up to the Pliocene, the groups of plants observed may be classed as—(1) Lower and Middle Cretaceous; (2) Middle and Upper Cretaceous, with modern evergreens, as *Salix*, *Populus*, *Magnolia*, *Betula*, *Quercus*, &c., and fan palms and cycads; (3) Laramie or Fort Tunis group, probably a transition from the Cretaceous to the Eocene, with many new forms; (4) Tertiary Flora of the probably Miocene Tertiary of British Columbia. Descriptions and figures of these plants are being prepared, and it is hoped may soon be published.—On the anatomy and development of cestoid worms, by Prof. Ramsay

Wright.—On lacustrine concretions from Grand Lake, N.S., by Prof. Honeyman, D.C L.—Illustrations of the fauna of the St. John, N.B. group, by G. F. Matthew.—On birds from Hudson's Bay, by Prof. Bell.—On a new classification of Crinoids, by Prof. E. J. Chapman. This classification is based essentially on the presence or absence of a canaliculated structure in the calyx and arm plates. Three leading divisions are thus recognised. In one, the plates are without internal canals; in the second, the arm plates are perforated internally; and in the third, a system of canals radiates from the base of the calyx to the extremities of the arms. The subdivisions have been worked out to bring readily under grasp the more salient or broadly distinctive features of all the better-known families and types; and as the common names of families embody very little indication of these features, an additional grouping into sections is adopted.—On the Lower Cretaceous rocks of British Columbia, by J. F. Whiteaves.—On the introduction and dissemination of some noxious insects, by Wm. Saunders.—On the geological history of the St. John (N.B.) river valley, by Prof. L. W. Bailly.—On recent discoveries in the life-history of *Botrydium granulatum*, a terrestrial Canadian alga, as illustrating phases of development in the lower forms of vegetation, by Prof. G. Lawson, Ph.D., LL.D.—On the Quebec group of rocks, by Dr. A. R. C. Selwyn.

The following officers were elected: President, J. W. Dawson, C.M.G., LL.D., F.R.S., Principal of McGill College, Montreal; Vice-President, Hon. P. J. O. Chauveau, LL.D.; Hon. Secretary, J. G. Bourinat, F.S.S., Ottawa; Hon. Treasurer, J. A. Grant, M.D., Ottawa.

ON SMELL

THE sense of smell is caused by the contact of certain substances with the terminal organs of the olfactory nerves, which are spread as a network over a mucous membrane lining the upper part of the nasal cavity. Each nerve consists of a number of small bundles, themselves capable of being split into extremely fine nerve fibres. There are spindle-shaped cells connected with these nerves, from which proceed two processes—one to the surface, provided with bundles of long hairlets; the other passes to the interior. It is these hairlets which are proprobably the proximate cause of smell.

Let us consider, first, by what are smells excited? The operation of smelling is performed by sniffing, that is, by a series of short inhalations of air, bearing with it the odorous body. The first question which suggests itself is: Is the substance which excites sensation a liquid, solid, or gas? It has been tried by Weber, to fill the nose with eau-de-Cologne and water, lying on the back for that purpose, and pouring the liquid into the nostrils by a funnel. No sensation is produced. I have myself tried the experiment, and can confirm his observation. There is an irritating feeling, but no smell. Of course, on washing out the nose, or blowing it, the characteristic smell is at once noticeable.

It is easy to prove that solid particles are not the cause of smell. If the air conveying the odour be filtered through a tube filled with cotton wool, and inserted into the nose, a smell is still discernible, although all solid particles must thereby be kept back. But it is a very remarkable circumstance that it is so, for one would not suspect such extremely non-volatile substances as copper, iron, silver, &c., to give off gas, if indeed the smell which they most certainly evolve when rubbed is due to the gas of the substance.

We must, therefore, conclude that the sense of smell is excited by gases only. It is of course necessary to include under the name gases the vapours of liquids or solids which have low vapour-tension, and which, in consequence, give off vapour at the ordinary temperature. It has been proved that this is the case even with mercury, the boiling point of which is over 300° Centigrade. We may consequently conclude that many other substances of which it is impossible to measure the vapour-tension at ordinary temperatures, owing to its extreme minuteness, also evolve gas, if only in very small quantities. But it is well known that all gases have not the power of exciting a sense of smell. Let us compare some gases which have smell, with some which have none, and endeavour to discover if those which have smell have any other property in common.

The following is a list of gases which have no smell:—Hydrogen, oxygen, nitrogen, water-gas, marsh-gas, olefiant-gas, carbon monoxide, hydrochloric acid, formic acid vapour, nitrous oxide, and ammonia. Those which possess smell are chlorine, bromine, iodine; the compounds of the first two with oxygen and water, the second three oxides of nitrogen (or perhaps it is right to say nitric peroxide, for the other lower oxides are changed into it when they come into contact with air); the vapours of phosphorus and sulphur; arsenic and antimony; sulphurous acid, carbonic acid, and almost all the volatile compounds of carbon, save those already mentioned; some compounds of selenium and tellurium; the compounds of chlorine, bromine, and iodine, with the above-named elements; and some metals.

In considering this list, I submit first, that the property of smell is peculiar to some elements and their compounds. Thus, chlorine, bromine, iodine, sulphur, selenium, and tellurium, which are volatile or give off vapour at ordinary temperatures, have a characteristic smell. We should expect their compounds to have a smell, and we find this to be the case. Second, those substances which have no smell, or produce simple irritation of the nostrils have all low molecular weight. Such is the case with hydrogen, the element of lowest specific gravity. Such also is the case with oxygen and nitrogen; but this as well as the absence of smell in water-vapour, may be ascribed to the constant presence of these gases in our atmosphere, and their necessary constant presence in our nostrils, so that we may be insensible to their smells because we are always inhaling them; but I think it probable that this is not so. Hydrochloric, hydrobromic, and hydriodic acids, and ammonia, have purely an irritating effect, and cannot be described as smells. When ammonia is pure and free from compounds containing carbon, it has no trace of smell. Nitrous oxide is also the lowest of the oxides of nitrogen, and as such has the lowest specific gravity. But it is when we turn to compounds of carbon that we are best able to draw general conclusions; for that element, *par excellence*, has the faculty of forming almost innumerable compounds, and series which resemble each other in properties, but differ in specific gravity. And here we are most struck with the fact that increase of molecular weight, *i.e.* increase of specific gravity in the form of gas, produces, to a certain point, smell. Let us examine the simplest series, viz. the marsh-gas or methane series, commonly called the paraffins. The first two of these have no smell. Ethane, indeed, which is fifteen times as heavy as hydrogen, begins to have a faint trace, but it is not till we arrive at butane, which is thirty times heavier than hydrogen, that a distinct sensation of smell is noticed. In the same manner, the olefine series, of which the first member is ethene, or olefiant gas, gains in smell with rise of molecular weight. Of course, the highest members of this series have no smell, for they are non-volatile, but this is the case with most carbon compounds of which the molecular weight is high.

A similar relation is noticeable among the alcohols. Methyl alcohol, in a state of purity, is smell-less; ethyl, or ordinary alcohol, when freed from ethers and as much as possible from water, has a faint smell, and the odour rapidly becomes marked as we rise in series, till the limit of volatility is reached, and we arrive at solids with such a low vapour tension that they give off no appreciable amount of vapour at the ordinary temperature. Again, with the acids, formic acid is smell-less, and produces a pure sensation of irritation. Acetic acid has a slight but charac, teristic smell; and the higher acids of the series, propionic butyric, valerianic acid, &c., gain in odour with increase in density in the form of gas. If we consider the nitrogenous compounds of carbon, we are led to the same conclusion. Prussic acid is not smelt by more than four persons out of every five; but the nitriles, which bear the same relation to prussic acid as the higher members of a series bear to the lower, have all very characteristic odours. Acetylene would appear to form an exception to this rule; but carefully purified acetylene has little odour, and it is surpassed by its higher homologues. We may therefore, I think, accept this as a principle—that the intensity of the smell rises with rise in molecular weight.

It is also noticeable that the *character* of a smell is a property of the element or group which enters into the body, producing the smell, and tends to make it generic. Thus we can characterise the compounds of chlorine and its oxides as chlorous; indeed we may group the three elements—chlorine, bromine, and iodine, together, and name the characteristic odour of them and their oxides haloid smells. Similarly, sulphur, selenium, and tellurium, in their compounds with hydrogen, have a generic smell; and likewise arsenic and antimony. The only oxide of nitrogen which is smelt is nitric peroxide, so that it is impossible to pronounce on a generic smell for this substance. It is, again,